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UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. 10/649,665

Confirmation No. 6920

Inventor: NEMOTO, N. et al.

Filed: August 28, 2003

Title: METHOD AND APPARATUS FOR MANAGING FAULTS IN STORAGE
SYSTEM HAVING JOB MANAGEMENT FUNCTION

Group Art Unit: 2171

Examiner: Unassigned

Attorney Docket No.: ASA-1155

Customer No. 24956

PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(d) (MPEP §708.02(VIII))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The Applicants petition the Commissioner to make the
above-identified application special in accordance with 37 CFR
§1.102(d). In support of this Petition, pursuant to MPEP §
708.02(VIII), Applicants state the following.

(A) REQUIRED FEE

This Petition is accompanied by the fee set forth in 37
CFR § 1.117(h). A Credit Card Payment Form in the amount of
\$130 accompanies this Petition in satisfaction of the fee.

The Commissioner is hereby authorized to charge any additional

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payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) ALL CLAIMS DIRECTED TO A SINGLE INVENTION

All the pending claims of the application, claims 1-20, are directed to a single invention. If the Office determines that all claims in the application are not directed to a single invention, Applicant will make election without traverse as a prerequisite to the grant of special status.

The claimed invention, as set forth in independent claims 1, 4, 7, 10, 14, and 17, is directed to a computer system, a server computer, a program executed by a server computer, and a method of managing faults in a storage system having a job management function for identifying a job in a computer system. The invention includes a computing device for executing jobs, a storage device including a plurality of physical disk units, and a computer for managing faults. A job may be affected by a fault at a location existing on a data mapping path. The data mapping path comprises a particular table on a database accessed by a particular job, a file for storing the table, a logical volume for storing the file, and physical disk units for distributively storing data

on the volume, based on data mapping information related to the data mapping path. The data mapping information includes an identifier of an interface situated on the data mapping path for interfacing one device to another. Part of the data mapping information is collected from each device that holds corresponding information on the data mapping path from the job to the physical disk units through the table, the file, and the volume. The data mapping information is integrated on a job-by-job basis for storage in a management table. A job affected by a fault is identified with reference to the management table for displaying the affected job upon receipt of a fault report about any of the physical disk units from the storage device.

(C) PRE-EXMINATION SEARCH

A careful and thorough pre-examination search has been conducted, directed to the invention as claimed. The pre-examination search was conducted in the following areas: Class 709, subclass 224; and Class 714, subclasses 25 and 42. Furthermore, a keyword search was conducted on the USPTO's EAST database. Additionally, a literature search was also conducted for relevant non-patent documents using DIALOG

online databases. In addition, a search for foreign patent documents was conducted on the ESPACENET databases, and included a search in international subclass G06F011/07P6, directed to error or fault localization.

(D) DOCUMENTS DEVELOPED BY THE PRE-EXAMINATION SEARCH

Of the documents reviewed during the search, those deemed to be most closely related to the subject matter encompassed by the claims are listed below. These documents were made of record in the present application by the Information Disclosure Statement filed December 8, 2004.

<u>Patent No.</u>	<u>Inventor(s)</u>
US 5500940	Skeie
US 6130875	Doshi et al.
US 6636981	Barnett et al.

<u>Pub. Pat. Appl.</u>	<u>Inventor(s)</u>
US 20020196744	O'Connor
US 20030172153	Vaver
US 20030229645	Mogi et al.
US 20040049572	Yamamoto et al.
US 20040064543	Ashutosh et al.
US 20040103210	Fujii et al.
US 20040153844	Ghose et al.

Additionally, the following document was made of record in the present application by the Information Disclosure Statement filed August 28, 2003.

<u>Patent No.</u>	<u>Inventor(s)</u>
US 6035306	Lowenthal et al.

Because all of the above-listed documents are already of record in the present application, in accordance with MPEP § 708.02(VIII)(D), additional copies of these documents have not been submitted with this Petition.

(E) DETAILED DISCUSSION OF THE REFERENCES

A discussion of each the above-listed documents is set forth below, pointing out, with the particularity required by 37 CFR 1.111 (b) and (c), how the claimed subject matter is patentable over the teachings of the above-listed documents.

The patent to Skeie, US5500940, shows a method of evaluating failure in a data storage system including multiple storage components operably interconnected. The method includes the step of detecting a failed component and assessing the importance of the failed component to the operation of the data storage. (See, e.g., Abstract and column 2, line 59, through column 3, line 30.) In contrast to the present invention, however, Skeie does not teach the use of a management table wherein data mapping information is integrated on a job-by-job basis for storage in the management

table, so that a job affected by a fault may be identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Skeie.

The patent to Doshi et al., US 6130875, shows a centralized approach for improving performance of a network. As illustrated in FIGS. 8 and 9, the system includes a link status table at one or more nodes of the network for identifying a number of specific failures and demands currently routed through the link which are affected by the failures. The nodes include a set of routing tables which specify routing paths through the network for particular demands. (See, e.g., Abstract and column 10, line 30 through column 14, line 53.) Although Doshi et al. teach a failure identification and restoration technique in the general environment of optical and electrical networks, Doshi does not show the technique of the present invention, such as collecting data mapping information from each device, and integrating the data mapping information on a job-by-job basis for storage in a management table, so that a job affected by a

fault is identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Doshi et al.

The patent to Barnett et al., US 6636981, shows a method for fault isolation in a storage area network including a plurality of host systems, switches, and storage peripherals connected in a SAN communications architecture. The system includes an information table comprising all connected elements of the network and explicit paths, so that when a failing component is reported, errors generated by the failing component along the same network connection path may be identified. (See, e.g., Abstract, column 1, lines 38-60, and column 9, lines 15-30.) In contrast to the present invention, Barnett et al. do not teach integrating data mapping information on a job-by-job basis for storage in a management table, so that a job affected by a fault may be identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Barnett et al.

The published US patent application to O'Connor, US 20020196744, shows a storage area network configured to automatically discover and identify storage devices and paths. A database describing selected storage devices and paths is created and stored within the host. Upon detecting a failure of the host, the corresponding storage devices indicated by the database are re-mapped. (See, e.g., Abstract and paragraph [0008].) Unlike the present invention, O'Connor does not include the step of collecting information from all the devices present in a data mapping path, or the integration of data mapping information on a job-by-job basis for storage in a management table, so that a job affected by a fault may be identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over O'Connor.

The published US patent application to Vaver, US 20030172153, shows a system for monitoring a network having a plurality of nodes interconnected by links, each node including a plurality of modules. The system includes a

network management system that gathers data associated with failed paths and modules responsible for failed paths in the network. The system also includes a path service storage arrangement that receives and stores the information relating to the paths in the network. (See, e.g., Abstract and paragraphs [0007]-[0011].) Although Vaver specifies that the network is used to send information to various databases for organized storage, Vaver does not teach the configuration of the present invention, in which data mapping information is integrated on a job-by-job basis for storage in a management table, so that a job affected by a fault is identified with reference to the management table for displaying the affected job upon receipt of a fault report about any physical disk units from a storage device, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Vaver.

The published US patent application to Mogi et al., US 20030229645, shows a storage area network environment that includes a data mapping management server that collects data mapping information about hierarchical structure information,

path connection mode information, and mapping aggregation information. (See, e.g., Abstract and paragraphs [0010]-[0017].) Unlike the present invention, Mogi et al. do not disclose the integration of data mapping information on a job-by-job basis for storage in a management table, so that a job affected by a fault may be identified by reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Mogi et al.

The published US patent application to Yamamoto et al., US 20040049572, shows a failure notification method in a storage area network including a plurality of servers and storage resources. The system includes a device table, providing information on the relationship between logical devices and disk drives, and a path table. When a particular device is failing within the network, it is reported centrally, and a data path affected by the event is shown. (See, e.g., Abstract and paragraphs [0061]-[0065].) However, unlike the present invention, Yamamoto et al. do not disclose the data mapping information being integrated on a job-by-job basis for storage in a management table, so that a job

affected by a fault is identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Yamamoto et al.

The published US patent application to Ashutosh et al., US 20040064543, shows a system monitoring process within a storage area network wherein tables are maintained from collected information identifying the components included in the storage domain as well as connections, paths, and associations between them. The system is also able to perform failure analysis wherein any non-functioning data paths are identified. (See, e.g., Abstract and paragraphs [0003]-[0007].) However, Ashutosh et al. do not teach the integration on a job-by-job basis of data mapping information for storage in a management table, so that a job affected by a fault may be identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Ashutosh et al.

The published US patent application to Fujii et al., US 20040103210, shows a network management apparatus that uses a management table storing currently used paths. On receiving failure occurrence notice of a link or a node, the paths using that node are identified from the table and alternative back-up paths are set up. (See, e.g., Abstract and paragraphs [0014]-[0018].) However, Fujii et al. do not disclose the collecting of data mapping information from the various devices. Nor do Fujii et al. disclose a system in which data mapping information is integrated on a job-by-job basis for storage in a management table, so that a job affected by a fault may be identified with reference to the management table, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Fujii et al.

The published US patent application to Ghose et al., US 20040153844, shows a method of managing faults in a storage area network with a plurality of storage devices connected by switches to a plurality of servers. A centralized failure analysis module compiles errors that come from the distributed storage controllers and storage systems to rapidly identify

failing systems and take actions. (See, e.g., Abstract and paragraphs [0045]-[0051].) However, unlike the present invention, Ghose et al. do not teach the use of a management table integrating data mapping information on a job-by-job basis, so that a job affected by a fault may be identified, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Ghose et al.

The patent to Lowenthal, US 6035306, is directed to a method for improving performance of large databases by providing an analysis tool that has a map of the logical and physical arrangement of a database being monitored. Lowenthal discloses a mapping technique between databases and storages that can be introduced into a SAN to analyze the performance of a database or files on a one-by-one basis. (See, e.g., Abstract and column 2, line 46, through column 3, line 8.) However, when a fault occurs in the storage system of Lowenthal, it is impossible to identify a particular job that is affected by the fault, with the only information on the fault being about devices associated therewith. Thus, in the event of such a fault, a manual investigation is required.

Thus, Lowenthal does not teach the present invention, in which a job affected by a fault is identified with reference to a management table integrating data mapping information on a job-by-job basis, as set forth in independent claims 1, 4, 7, 10, 14, and 17. Accordingly, the claims of the present application are believed to be patentable over Lowenthal.

CONCLUSION

The Applicants submit that the foregoing discussion demonstrates the patentability of the claimed invention over the closest-known prior art, taken either singly or in combination. Accordingly, the requirements of 37 CFR \$1.102(d) having been satisfied, the Applicants request that this Petition to Make Special be granted and that the application be examined according to prescribed procedures set forth in MPEP \$708.02 (VIII).

The Applicants prepared this Petition in order to satisfy the requirements of 37 C.F.R. \$1.102(d) and MPEP \$708.02 (VIII). The pre-examination search required by these sections was "directed to the invention as claimed in the application for which special status is requested." MPEP \$708.02 (VIII). The search performed in support of this Petition is believed to be in full compliance with the requirements of MPEP \$708.02 (VIII); however, Applicants make no representation that the search covered every conceivable search area that might contain relevant prior art. It is always possible that prior art of greater relevance to the claims may exist. The Applicants urge the Examiner to conduct his or her own complete search of the prior art, and to thoroughly examine

this application in view of the prior art cited above and any other prior art that may be located by the Examiner's independent search.

Further, while the Applicants have identified and discussed certain portions of each cited reference in order to satisfy the requirement for a "detailed discussion of the references, which discussion points out, with the particularly required by 37 C.F.R. §1.111(b) and (c), how the claimed subject matter is patentable over the references" (MPEP §708.02(VIII)), the Examiner should not limit review of these documents to the identified portions, but rather is urged to review and consider the entirety of each reference.

Respectfully submitted,



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